GROUND WATER PROTECTION IN VIRGINIA

TWENTIETH ANNUAL REPORT OF THE
GROUND WATER PROTECTION STEERING COMMITTEE

Steering Committee Completes Twentieth Year!

The Ground Water Protection Steering Committee was originally formed to produce a strategy for ground water protection initiatives in the Commonwealth. This interagency group worked throughout 1986 to produce *A Groundwater Protection Strategy for Virginia* (publication date May 1987). It was decided the Steering Committee would continue to meet after the Strategy was complete to stimulate and strengthen ground water protection measures in the Commonwealth.

Each year since 1988 the Steering Committee has published an *Annual Report*, entitled *Ground Water Protection in Virginia*. This year's publication reflects on protection activities from calendar year 2006. Our meetings are open to the public; please visit http://www.deq.virginia.gov/gwpsc/homepage.html for meeting dates and agendas. Or contact Mary Ann Massie at 804-698-4042 or mamassie@deq.virginia.gov

The following agencies have representation on the Ground Water Protection Steering Committee:

Virginia Department of Environmental Quality (chair)

Virginia Department of Health

Virginia Cooperative Extension

Virginia Department of Business Assistance

Virginia Department of Conservation and Recreation

Virginia Department of Mines, Minerals, and Energy

Virginia Department of Agriculture and Consumer Services

Virginia Department of Housing and Community Development

Virginia Department of General Services/Division of Consolidated Laboratory Services

US Geologic Survey

Visit www.deq.virginia.gov/gwpsc for member links.

DEQ Water Resources Division Staff Update:

The Office of Ground Water Characterization, led by Scott Bruce, is fully staffed. Brad White, bawhite@deq.virginia.gov, has responsibilities for characterization activities in the Piedmont and Blue Ridge Physiographic Provinces. Joel Maynard, jpmaynard@deq.virginia.gov , has responsibilities for characterization activities in the Valley and Cumberland Plateau Physiographic Provinces. Todd Beach, tabeach@deq.virginia.gov , has responsibilities for characterization activities in the Coastal Plain.

The organizational object of the Office of Ground Water Characterization is to protect Virginia's environment and promote the health and well being of its citizens by collecting, evaluating, and interpreting technical information necessary to manage the ground water resources of the Commonwealth. Scott Bruce can be reached at tsbruce@deq.virginia.gov or 804-698-4041.

The Office of Ground Water Withdrawal Permitting, led by Robin Patton, is fully staffed. Four modelers work with Regional permit writers and applicants to determine potential impacts to ground water resources from permitted withdrawals in the Eastern Shore and Eastern Virginia Ground Water Management areas. Beverly Quinlan, Jenny Wright, Erich Foster, and Jeff Chanat model impacts to aquifers from permitted

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Wellhead Protection in the Commonwealth

www.deq.virginia.gov/gwpsc/whp

Wellhead protection activities are on the rise in the Commonwealth. While there has not been a stampede to graduate ***from assessing*** a public water supply's contamination susceptibility ***to implementing*** measurable protection activities, there continues to be interest at the local level (and in some instances success!) in developing strategies to protect ground water resources.

The 1996 amendments to the Safe Drinking Water Act (SDWA) expanded protection concepts from ground water based public water supply systems to all sources of water serving public water supply systems, including surface water. The 1996 amendments also required assessments to evaluate every public water supply system's vulnerability or susceptibility to contamination. These mandatory assessments were supported with dedicated funding from the Drinking Water State Revolving Loan (DWSRF) set asides; assessments were completed by the Virginia Department of Health (VDH). Information gained through the assessments was shared with system owners and consumers. Federal and State officials were hopeful these assessments and susceptibility determinations would be the foundation for protection programs. While a dedicated source of SDWA funds to move from assessment to protection has never been realized, funding and technical assistance are available.

Opportunities for technical assistance:

The **Virginia Rural Water Association** (VRWA) provides technical assistance to small public water supply systems (serving 10,000 people or less). Part of their ongoing assistance includes source water protection plan writing. Mr. Albert Crigger and Ms. Nancy Carr are available to help small public water supply systems develop protection plans. Their involvement is often the catalyst to initiate a local protection program. They are experienced in reviewing assessments, evaluating tools to address sources of potential contamination, building a protection "team", and seeing the project to implementation. For more information on assistance from VRWA visit their web site at www.vrwa.org

VDH and their contractor, **Olver Incorporated**, are implementing a program that provides technical support to assist small ground water based public water supply supplies (serving less than 3,300 people) with wellhead protection plan development. Through this program, small waterworks are contacted by Olver Incorporated to describe the program and its benefits, and to determine the waterworks interest in participating in the program. Olver then assists the participating waterworks in forming a community-based local advisory committee and works with that committee to review and identify potential sources of contamination for their water sources and to develop a wellhead protection plan to prevent contamination of their drinking water supply. As part of this program, a public information brochure is also developed specifically for each waterworks to inform and educate the local community. To date, over thirty community waterworks have completed wellhead protection plans through this program. For more information on the VDH program visit http://www.vdh.virginia.gov/drinkingwater/source/wellheadsteps.htm

The Virginia Ground Water Protection Steering Committee completed three publications in the 1990s to educate local government officials on the concepts of wellhead protection and to promote implementation activities. These publications can be found at http://www.deq.virginia.gov/gwpsc/whp.html

Opportunities to fund wellhead protection activities:

Following Federal approval of the State's Voluntary Wellhead Protection Plan, DEQ and VDH worked together to issue a "Request for Proposals" from local governments to implement wellhead protection. A combination of SDWA set aside funds and Clean Water Act funds were used to fund the projects. Three awards were made in 2005 totaling $31,250. A second "Request for Proposals" from local governments to implement wellhead protection was issued July 2006. Four awards were made totaling $147,390. Interest is increasing! Unfortunately funding levels are not increasing. However, as long as VDH and DEQ are able to earmark a portion of their federal dollars toward implementation these "Request for Proposals" will continue. Our goal is to issue the request annually in June or July to enable contracts to be in place by October 1. Information can be found at http://www.deq.virginia.gov/gwpsc/whp.html

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Success stories:

Working with the Giles County Public Service Authority (PSA), several of the communities in Giles County prepared a wellhead protection plan through the VDH program. The PSA provides wholesale water services to six different towns and nine local subdivisions in the County. One particular concern for the PSA and the communities was the regional limestone geology which is characterized by sinkholes, caverns, caves, and solution channels which allow for rapid migration of any ground water contaminants. Each of the PSA members sent representatives to collaborate on the development of the wellhead protection plan. The plan developed for the waterworks includes distributing the site-specific public education brochure and information on septic system maintenance to the local residents; installing signs along the highway informing commuters and residents that they are in a wellhead protection area; painting "no dumping, drinking water protection area" on storm drains; informing residents about the significance of sinkholes as a direct conduit to ground water; and, working with pesticide retailers and applicators to educate both the retailers and applicators about source water protection, stressing safe application and storage practices. Giles County and the individual towns within the County are also working together to develop a designated Wellhead Protection Overlay District for public water systems and are considering Wellhead Protection standards and other measures that will protect ground water resources.

Another community that has developed a wellhead protection plan through the VDH program is the Town of Mount Jackson. The Town is located in the Valley and Ridge physiographic province of Virginia, and its drinking water comes from 5 wells located in nearby agricultural, residential, and industrial regions. Potential sources of contamination within the Town's wellhead protection areas include chemical spills and other runoff from a nearby interstate, threats from gas stations, leaky fuel and underground storage tanks, on-site septic systems, sinkholes, pesticides usage and manufacturing, residential activities, and industrial activities. As part of the wellhead protection plan, the Town's local advisory committee decided to install signs along the major roadways that state "Entering a Source Water Protection Area"; send a public information brochure to all residents and businesses within the wellhead protection area; post information about wellhead protection and karst topography on the Town website and in the Town offices; and, notify VDOT State and District offices of the Wellhead Protection Area that is crossed by I-81. The Town is also evaluating changes that can be made to the Comprehensive Plan and is also investigating obtaining conservation easements within the designated wellhead protection areas.

James City Service Authority (JCSA) continued their award winning CapIt program with funds awarded through the joint VDH/DEQ Request For Proposals. CapIt is a unique ground water protection program that combines public education with free well abandonment. JCSA estimates that over four hundred non abandoned private wells exist in the County (Nov 2005). These wells can serve as conduits for contaminants to affect the JCSA's source water. In the first four years of the program, 165 wells were properly abandoned. Applications are prioritized to abandon wells closest to ground water based public water supplies. This program was recognized by the Environmental Protection Agency in 2002 as a Source Water Protection Award recipient.

The Accomack-Northampton PDC was awarded funds to hold a Household Hazardous Waste Collection Day on the Shore. This collection program was part of their Ground Water Committee's Pollution Prevention Program. Residents who pre-register are allowed to bring up to 30 pounds of material for disposal at no cost. Thirty eight residents participated with 1,302 pounds of household hazardous waste collected.

Two ground water systems in Rockingham County have successfully used a downhole camera analysis recommended by Virginia Rural Water Association. One system discovered leaks in the casing and installed a liner to eliminate infiltration. The other system discovered a large cave (void) in the well hole with a partially collapsed ceiling. This water system plans to pursue a dye trace study of the sinkholes in the protection area around the well. Results will be used to target a karst education program. The Virginia Rural Water Association's Ground Water Specialist worked with this system's protection committee to outline a management plan that promotes funding for sinkhole buffers and encourages local conservation staff to consider the recharge areas for these wells.

Ground Water Festivals

http://www.deq.virginia.gov/gwpsc

Local volunteers organized ground water festivals in three different locations to teach sixth grade students and their teachers about ground water protection concepts and to improve environmental stewardship across the Commonwealth.

In mid May 2006 two hundred sixth graders from Russell County public schools attended a Natural Resource festival held at the Russell County fairgrounds. Ms. Angela White with the Clinch Valley Soil and Water Conservation District organized the festival. Nineteen educators and forty six volunteers manned fourteen educational stations covering many aspects of our environment.

Two festivals held for the Lancaster County and Northumberland County sixth graders were organized by Mrs. Audrey Brainard, Mrs. Kathy Moeller, and Ms. Maggie Peill. Two hundred fifteen students attended the festivals which were held at the YMCA's Camp Kekoka.

In mid October 2006 four hundred fifty Dickenson and Buchanan County sixth graders attended three festivals held at Breaks Interstate Park. With snow falling on the first day the park system donated the use of their indoor conference rooms! Mr. Toby Edwards with the Cumberland Plateau Regional Waste Management Authority organized the festivals with assistance from Mr. Jerry Ward, Mr. Richard Lee, and Ms. Bonnie Mullins from the Buchanan County Litter Control and Recycling Office and from Mr. Eugene Mullins and Mr. Lester Turner from the Dickenson County Litter Control and Recycling Office. The local television station, WCYB TV5, covered the festival in their Education Focus segment.

Students attending the festivals received backpacks with the festival logo.

For more information on the festivals contact Mary Ann Massie at the Virginia Department of Environmental Quality mamassie@deq.virginia.gov

The following organizations supported the festivals. Their support, through volunteer staff time and/or funding, is greatly appreciated.

US Environmental Protection Agency

Virginia Department of Environmental Quality

Clinch Valley Soil and Water Conservation District

Russell County Environmental Council
Virginia Rural Water Association

USDA Natural Resources Conservation Service

OSM/VISTA representative with the Upper Tennessee River Roundtable

Castlewood High School

Russell County Farm Service Agency

Cumberland Plateau Regional Waste Management Authority

Russell County Litter Control and Recycling Office

Virginia Department of Mines, Minerals, and Energy

Virginia Department of Forestry

Russell County Health Department

Virginia Cooperative Extension

Virginia Department of Game and Inland Fisheries

OSM/VISTA representative with the

Clinch Valley SWCD

Northumberland Association for Progressive Stewardship

Chesapeake Bay Garden Club

Mt. Olive Baptist Church

Northern Neck Audubon Society

Northumberland County Health Department (Three Rivers Health District)

Peninsula YMCA

Rappahannock Garden Club

SAIF Water Committee

Breaks Interstate Park/Virginia Department of Conservation and Recreation

Dickenson County Litter Control and Recycling Office

Buchanan County Litter Control and Recycling Office/Keep Buchanan Beautiful

Lonesome Pine Soil and Water Conservation District

Big Sandy Soil and Water Conservation District

Cumberland Plateau Health District

McClure and Russell Fork River Groups

Buchanan and Dickenson County Schools

Funding for the Virginia Ground Water Protection Steering Committee activities, including development of this Report, is provided through a grant to the Department of Environmental Quality by the U.S. Environmental Protection Agency.

The Ground Water Protection Steering Committee meeting is held on the third Tuesday of March, May, July, September, and November. Meetings are generally held at the Department of Environmental Quality, 629 East Main Street, Richmond from 9 a.m. to 11 a.m. Meetings are open to the public. For more information contact Mary Ann Massie at DEQ 804-698-4042 or email mamassie@deq.virginia.gov or visit www.deq.virginia.gov/gwpsc . Meeting summaries and announcements are posted on the Regulatory Townhall at www.townhall.virginia.gov

The Ground Water Protection Steering Committee is an inter-agency advisory committee formed to stimulate, strengthen and coordinate ground water protection activities in the Commonwealth. The Annual Reports allow us to highlight our progress; to educate Virginia citizens, businesses, and officials about the importance of ground water; and to publicize state programs that can assist those relying on ground water to ensure its continued quality and availability. Particular emphasis is made at the meetings on education and information exchange. Meetings are open to the public. In 2006 our members and guests heard presentations on activities in DEQ's Office of Water Supply Planning, DMME's electronic permitting and mapping accomplishments in their Division of Mined Land Reclamation, progress by local governments meeting DEQ's Solid Waste Management Plan requirements, and a State observation well that is responsive to teleseismic waves generated by large earthquakes via the USGS. For more information on the Steering Committee visit www.deq.virginia.gov/gwpsc or call Mary Ann Massie at 804-698-4042.

The U.S. Geological Survey

http://va.water.usgs.gov

Revision of a computer model of ground-water flow on the Virginia Eastern Shore continued during 2006, in cooperation with the Accomack-Northampton PDC, and the Virginia Department of Environmental Quality (DEQ). The Eastern Shore of Virginia is a sole source aquifer that has been designated by the Commonwealth of Virginia as a ground-water management area. Calibration of the final fine-grid model was nearly completed after evaluation of combination of aquifer and confining layer parameters at 21 locations across the model area. The Eastern Shore model will be documented in a report planned for publication during 2007, and will be used by local communities for long-term water supply planning and by DEQ to support ground-water permitting decisions.

A large scale effort for region-wide characterization of ground water throughout the Virginia Coastal Plain also continued during 2006 in cooperation with DEQ and the Hampton Roads Planning District Commission (HRPDC) (see 2000-06 Annual Reports). Southeastern Virginia and the York-James Peninsula have been designated by the Commonwealth of Virginia as a groundwater management area, and ground-water withdrawals on the Middle Peninsula and Northern Neck also are increasing. A report that documents a refined hydrogeologic framework representing the compositions, configurations, and properties of aquifers and confining units across the entire Virginia Coastal Plain was approved by the USGS Director as Professional Paper 1731, and is planned to be printed and distributed during 2007.

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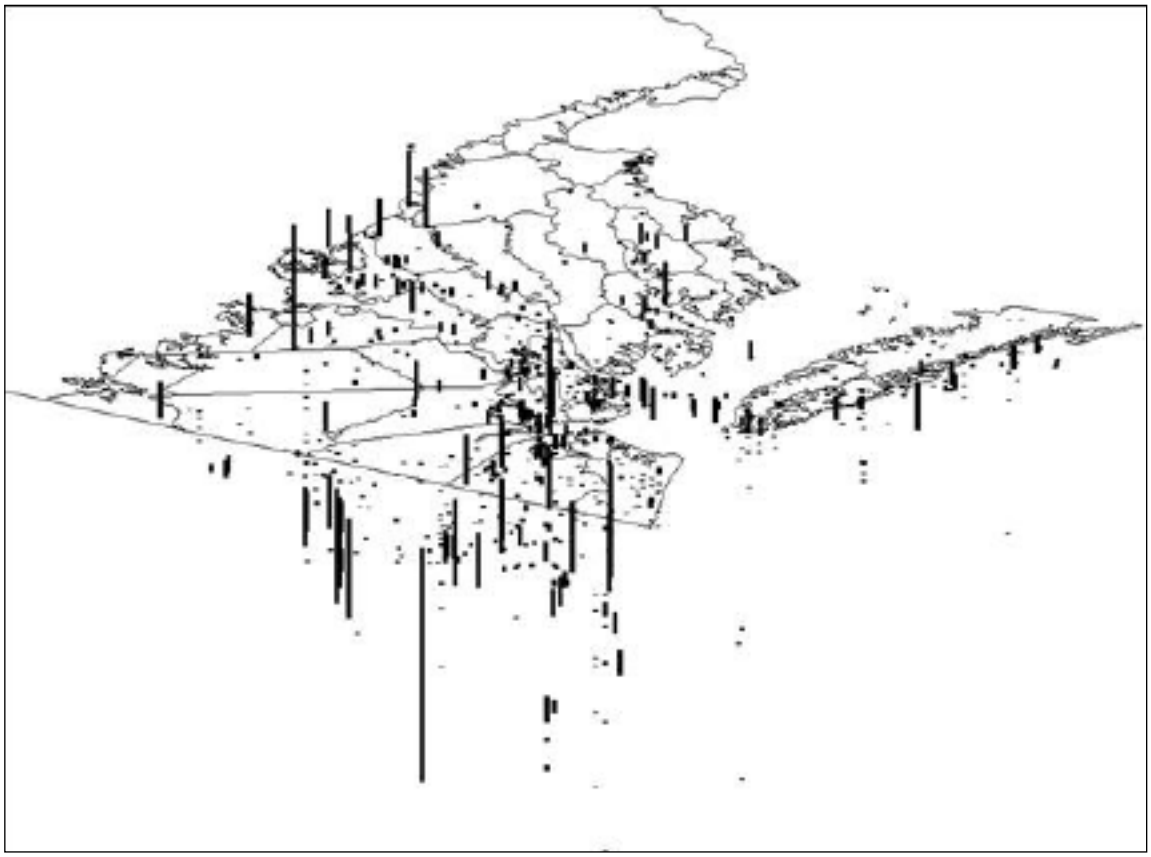

Figure 1. GIS-generated perspective view of the screened intervals of wells beneath the Virginia Coastal Plain from which ground-water quality samples have been collected and analyzed by USGS. (Vertical scale is greatly exaggerated.)

Also during 2006, a new computer model of ground-water flow in the Virginia Coastal Plain that incorporates the refined framework, along with reported ground-water withdrawals and estimates of unreported domestic withdrawals, was calibrated to historical measurements of ground-water levels and drawdowns. A beta-version of the new model (with preliminary calibration) also was evaluated by DEQ and HRPDC as a means to support ground-water withdrawal permitting decisions and water-supply planning. The model will be documented in a USGS Scientific Investigations Report planned for 2007, and will be available to the general public when the report is published and distributed. A separate report on private domestic wells and withdrawals in the Virginia Coastal Plain is also planned for 2007.

A study to characterize the chemical quality of ground water also was begun during 2006. A formal study plan was drafted and approved, and retrievals were made from USGS data bases of 4,243 ground-water quality samples collected from 3,633 wells during a period of approximately 100 years. The data were then analyzed using a geographic information system (GIS) (fig. 1) to identify the aquifers from which the samples originated according to the new hydrogeologic framework. Chloride-concentration and specific conductance values were further analyzed to provide a preliminary determination of the configuration of the freshwater-saltwater transition zone beneath Hampton Roads. Augmentation of these data is planned for 2007 from EPA, DEQ, and Virginia Department of Health (VDH) data bases. Evaluation and further analysis of the final data set is planned for 2008, and publication of study results for 2009.

Lastly in the Virginia Coastal Plain, a study plan was drafted with the City of Virginia Beach to accomplish the following objectives in fiscal years 2007 – 2009, as part of the Virginia Beach Ground-Water study: (1) continue monitoring ground-water levels and water quality of the shallow aquifer system; (2) explore local and seasonal salt-water intrusion by installing real-time probes and performing repeat Electomagnetic geophysical resistivity logs; (3) improve the understanding of shallow ground-water fluxes and mass balance in northern Virginia Beach by completing a detailed survey of seasonal water use, analyzing meteorological data, and presenting the results in an informative brochure, and; (4) begin hydrogeologic characterization of the deep confined aquifer system by compiling existing well information and siting and drilling a limited number of exploratory wells.

The USGS continued the cooperatively funded assessments on the availability of ground water in the northern Shenandoah Valley carbonate and fractured-rock aquifer systems with Frederick, Warren, and Clarke counties, and continued the South Fork Shenandoah River Minimum Instream Flow (MIF) investigation with the Northern Shenandoah Valley Regional Commission and the Central Shenandoah Planning District Commission. Scientific Investigations Report 2006-5025, Physical Habitat Classification and Instream Flow Modeling to Determine Habitat Availability during Low-Flow Periods, North Fork Shenandoah River, Virginia (http://pubs.usgs.gov/sir/2006/5025/) by Jennifer L. Krstolic, Donald C. Hayes, and Peter M. Ruhl was printed and distributed during 2006.

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Plastic Pesticide Container Recycling Program

The Virginia Department of Agriculture and Consumer Services (VDACS), in cooperation with the Virginia Pesticide Control Board (PCB) and Virginia Cooperative Extension (VCE) and local governments, recycled a total of 72,595 pesticide containers from 19 localities and 9 pesticide dealer locations in 2006. Since its inception, Virginia's Plastic Pesticide Container Recycling Program has collected and granulated a total of 817,595 pesticide containers.

The Plastic Pesticide Container Recycling Program is an environmentally responsible alternative for the disposal of properly rinsed plastic pesticide containers. Granulated chips are transported to recycling facilities and fabricated into items such as pallets, fence posts, field drain tiles and parking stops thus keeping them out of landfills.

To participate in the Program, a locality must make application to VDACS and agree to collect, inspect and store the properly rinsed containers until granulation. VDACS provides $1,875 in reimbursement costs to participating localities to offset the cost of the program.

For additional information visit the Virginia Department of Agriculture and Consumer Services at http://www.vdacs.virginia.gov/pesticides/recycling.shtml or contact Liza Fleeson, Environmental Program Planner, Office of Pesticide Services, at liza.fleeson@vdacs.virginia.gov or 804-371-6561.

Photo courtesy of Glenn Rountree, Extension Agent, Isle of Wight County.

Pesticide Disposal Program

The Virginia Department of Agriculture and Consumer Services (VDACS), in cooperation with the Virginia Pesticide Control Board (PCB) and Virginia Cooperative Extension (VCE), completed the 2006 Pesticide Disposal Program in mid November. The program assists agricultural producers, pesticide dealers and pest control firms with the proper disposal of unwanted agricultural and commercial pesticides and is available at no cost to participants. A total of 85,315 pounds of canceled, banned or unwanted agricultural and commercial pesticides were collected and subsequently destroyed. Since its inception, Virginia's Pesticide Disposal Program has collected and destroyed a total of 1,331,166 pounds of pesticides.

The program, which is free for participants, is funded through pesticide fees collected by VDACS' Office of Pesticide Services.

The 2007 Pesticide Disposal Program will be conducted in central Virginia and includes the following localities: counties of Amelia, Amherst, Appomattox, Bedford, Brunswick, Buckingham, Campbell, Charlotte, Cumberland, Franklin, Halifax, Henry, Lunenburg, Nottoway, Mecklenburg, Patrick, Pittsylvania, Prince Edward and the cities of Bedford, Danville, Lynchburg, Martinsville and South Boston.

For additional information visit the Virginia Department of Agriculture and Consumer Services at http://www.vdacs.virginia.gov/pesticides/disposal.shtml or contact Liza Fleeson, Environmental Program Planner, Office of Pesticide Services, at liza.fleeson@vdacs.virginia.gov or 804-371-6561

Photo courtesy of Josh Marvel, Extension Agent, Frederick County.

Virginia DEQ Waste Division Reorganization

http://www.deq.virginia.gov/waste/

Effective November 25, 2006 DEQ's Office of Waste Permitting was split into the Office of Solid Waste and the Office of Hazardous Waste Permitting.

The Office of Solid Waste functions include solid waste facility siting review (Part A), permitting functions related to solid waste ground water monitoring and ground water corrective action at landfills, and the solid waste permit support/regional coordination functions. This office is under the direction of Debra Miller (damiller@deq.virginia.gov). Debra comes to the Office of Solid Waste from the Division's Office of Remediation Program's Federal Facilities Restoration Program. She has worked with the agency for over 16 years, and has worked in both hazardous waste permitting and solid waste permitting, and initially started with the agency in the solid waste compliance program. The newly created Office of Solid Waste works with DEQ's Regional Offices regarding not only solid waste ground water issues, but also regional coordination issues for solid and hazardous waste compliance and solid waste facility permitting. The current staffing of the Solid Waste Ground water Program is five full-time staff (one is currently vacant) plus one technical reviewer. The solid waste ground water program is being evaluated and, depending on the results of this evaluation, changes to the program's staffing levels and reporting structure are likely to occur in the near future.

The renamed Office of Hazardous Waste Permitting will focus on the permitting of hazardous waste management facilities and site-wide RCRA Corrective Action activities, and continues under the direction of Leslie Romanchik (laromanchik@deq.virginia.gov). The Office of Hazardous Waste Permitting oversees the implementation of facility activities to address the investigation and cleanup, and provide oversight of field activities, of RCRA facilities in Virginia with soil and ground water contamination resulting from waste management practices. Current staffing of the Office of Hazardous Waste Permitting are seven permit writers and a team leader, four ground water permit writers (two are currently vacant) and a team leader (also vacant), and a Corrective Action Program Coordinator.

The Waste Division maintains a web page at http://www.deq.virginia.gov/waste/ Cynthia Houchens is the Waste Division's administrative assistant and can direct your call to the appropriate staff person. Cynthia's direct phone number is 804-698-4145. Erich Weissbart represents the Waste Division on the GWPSC. Erich can be reached at ejweissbart@deq.virginia.gov

Virginia Department of Housing and Community Development

http://www.dhcd.virginia.gov

In December 2006 the Virginia Department of Housing and Community Development (DHCD) announced the following financial assistance awards:

Virginia Community Development Block Grants (VCDBG) totaling more than $3.5 million were awarded to King and Queen County, and the towns of Gretna, Saltville and Blackstone. Grants are awarded on a competitive basis to projects designed to help communities serving low- and moderate- income individuals and families, and include projects that upgrade infrastructure, remove blight, and facilitate investment and job creation.

King and Queen County was awarded a $1 million grant to substantially improve living conditions in the Snow Hill Road area. The project entails the substantial reconstruction of five homes and the rehabilitation of 18 homes to housing quality standards, benefiting 88 individuals. Additionally, well and septic problems for 21 homes will be upgraded, and debris piles and scrap cars will be removed.

The Town of Gretna will receive $1,152,500 to eliminate a severe health hazard and rehabilitate substandard housing in the Northeast Gretna Neighborhood Project. The project will include the repair or replacement of 11 failed septic systems, removing a severe health hazard, and will include the rehabilitation of 13 homes and substantial reconstruction of four homes. Additionally, 3,800 linear feet of water line will be installed. Seventy-six individuals will be served by these projects.

As background, the VCDBG is a federally-funded grant administered by the Virginia Department of Housing and Community Development since 1982. Virginia receives up to $19 million annually for this "small cities" Community Development Block Grant (CDBG) program. Currently, 284 localities in Virginia who do not receive CDBG funds directly from the federal government are eligible for VCDBG funding.

DEQ Water Resources Division Staff Update:

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and planned withdrawals; they provide technical support to the permit writers in the Regional Offices. Hank Ghittino, hlghittino@deq.virginia.gov, issues ground water withdrawal permits from the DEQ Tidewater Regional Office; B.N. Sinha, bnsinha@deq.virginia.gov, issues ground water withdrawal permits from the DEQ Piedmont Regional Office. Permitting questions should be directed to the appropriate permit writer. Previn Smith, pdsmith@deq.virginia.gov, issues permits for historic-based agricultural use in the Eastern Shore and Eastern Virginia Ground Water Management areas. Lee Crowell, lmcrowell@deq.virginia.gov, recently came on board to develop a compliance and enforcement program for the Office of Ground Water Withdrawal Permitting. For general questions on the Office of Ground Water Withdrawal Permitting contact Robin Patton at rwpatton@deq.virginia.gov or 804-698-4085. For information on the Ground Water Management Act of 1992, designated ground water management areas, or regional boundaries visit http://www.deq.virginia.gov/gwpermitting/

The Office of Water Supply Planning, led by Scott Kudlas, has the following staff to assist local water supply planning efforts throughout the Commonwealth:

(Regional Office – RO)
Adrienne Averett, adrienne.averett@deq.virginia.gov, South Central RO

Dalayna Tillman, dmtillman@deq.virginia.gov, Valley RO

Tammy Stephenson, tammy.stephenson@deq.virginia.gov , West Central and South West RO

Christine J. Breth, christine.breth@deq.virginia.gov, Tidewater RO

Andrea "Andy" Putscher, andrea.putscher@deq.virginia.gov, Northern RO

Bill Norris, william.norris@deq.virginia.gov, Piedmont RO

Program manager Scott Kudlas can be reached at scott.kudlas@deq.virginia.gov or 804-698-4456. The Office of Water Supply Planning maintains a web site at http://www.deq.virginia.gov/watersupplyplanning/

The U.S. Geological Survey

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The USGS also continued construction and calibration of a regional ground-water-flow model of the Shenandoah Valley (fig. 2) to better define the availability of ground water in the region and its response to current and future development. The model represents a 7,500-km2 area that contains three hydrogeologic units that correspond to the major rock types in the Shenandoah Valley (siliciclastic rocks, carbonate rocks, and crystalline rocks). In a novel approach, hydraulic connections along bedding planes within the rocks are represented by specifying variable anisotropy based on bedding form-surfaces interpolated from generalized geologic cross-sections. The model was calibrated to base flow in major streams and water levels measured in wells. The sensitivity of predicted ground-water flow paths and ages is being investigated by changing (1) the degree of anisotropy, (2) the distribution of permeability with depth, and (3) the representation of folds and faults.

Other avenues of on-going USGS research in the Valley continued in 2006 and results from these efforts will begin to be published during 2007. Geophysical methods under development by the Office of Ground Water, Branch of Geophysics are being tested in the Shenandoah Valley to (1) delineate karst features including voids, conduits, pre-collapse sinkholes, fracture zones, and faults: and (2) observe and monitor hydrologic processes such as focused ground-water discharge. Sites were visited and surveyed using two innovative geophysical methods: (1) a land surface-wave seismic imaging system with a towed seismic sensor package; and (2) a field-scale fiber-optic temperature monitoring system to investigate ground-water discharge to the Shenandoah River. The use of multiple environmental tracers to interpret the age and age distributions of mixtures in ground water discharging from karst springs was expanded to include two new environmental tracers that the USGS recently developed for ground-water dating – SF5CF3 and CFC-13. The ground-water age and mixing information are needed in the development and calibration of planned and future ground-water flow models for parts of the Shenandoah Valley. The digital geologic map of the Stephens City 1:24,000-scale quadrangle was published on the internet and is available at: http://pubs.usgs.gov/of/2006/1173/.

Finally, the USGS and DEQ began implementing a statewide network of conductivity probes and chloride samples to estimate the base-flow component of streams at gaging stations in Virginia. The Shenandoah Valley was selected for more intense data collection where all current streamflow gaging stations will be instrumented, as well as selected wells and springs. The data will be used to better understand the ground-water flow system and the interactions between the ground-water and surface-water systems, resulting in more accurate numbers for water budgets in water availability studies and enhancement of local and regional ground-water/surface-water models.

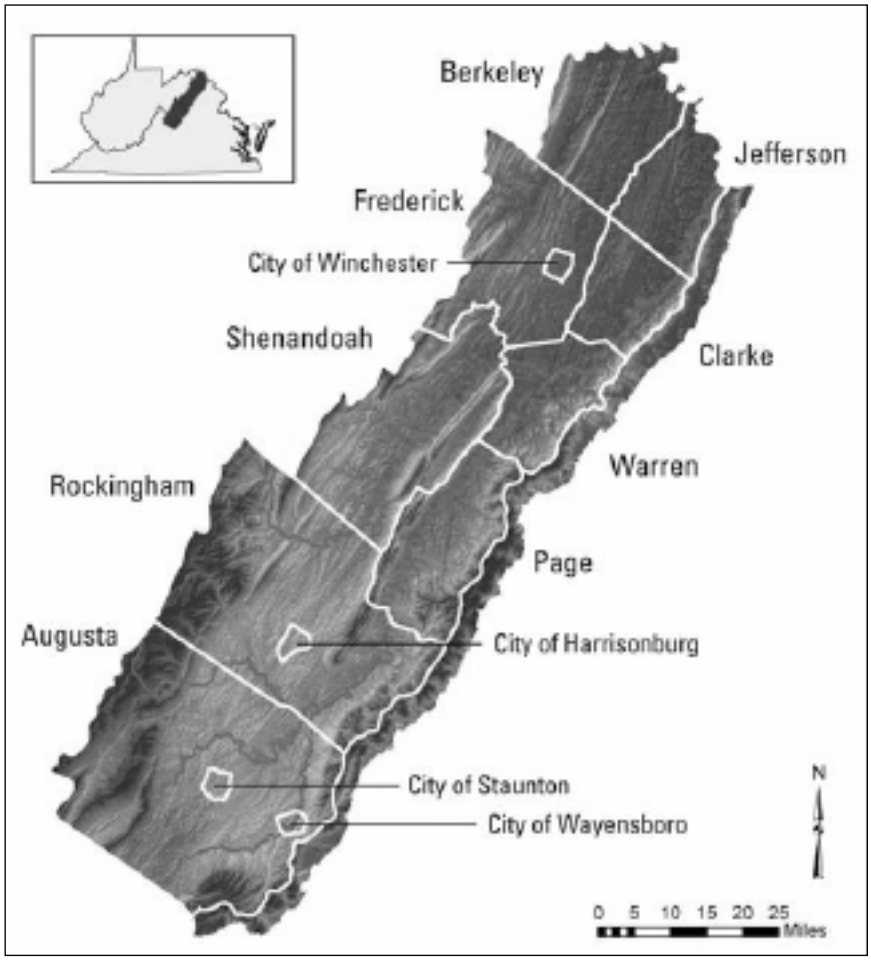

Figure 2. Cities and counties included within the domain of the ground-water flow model of the Shenandoah Valley.